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hydrogen 1, as is the case with olefiant gas; but these are so combined and condensed as to occupy only one half the volume they do in that substance. A volume therefore of the gas contains four proportionals of carbon 24, and four of hydrogen, 4 = 28, which is its specific gravity.

Beside the remarkable difference thus established between this substance and olefiant gas, it is also distinguished by the action of chlorine, which forms with it a fluid body, having a sweet taste, and resembling hydrochloride of carbon, but from which a chloride of carbon cannot be obtained by the further action of chloride and light.

The other products from the original fluid do not present any characters so definite as the above substances; at the same time they appear to be very constant, boiling uniformly at one temperature. They cannot be separated by distillation into more and less volatile parts, so as to afford means of reducing their number to two or three particular bodies. They have the general properties of the original fluid, and with the other products, are all peculiarly acted upon by sulphuric acid, offering phenomena, in the investigation of which the author is at present engaged.

With reference to the presence of these substances in the state of vapour in oil- and coal-gas, the means of ascertaining it and the quantity are pointed out, in the peculiar action of sulphuric acid, causing their perfect condensation, and in the solvent powers over them possessed by fixed and volatile oils, &c.; the requisite precautions for their proper application being pointed out. Oil-gas was found to be saturated with many of these vapours: coal-gas also contained a portion of them.

The paper concludes with a short reference to the probable uses of the fluid, as originally obtained. If put into gas burning with a blue flame, it makes it produce a bright white flame; it is an excellent solvent of caoutchouc; it will answer all the purposes to which essential oils are applied as solvents; and having applied that portion of it which, though a liquid at common temperatures and under a pressure of two or three atmospheres, is a gas under any diminished pressure, as fuel to a lamp; the author has shown the possibility of such an application, if at any time such knowledge and command of the decomposition of oil or coal by heat should be obtained, as would enable us to furnish the substance in abundance.

Account of the Repetition of M. Arago's *Experiments on the Magnetism manifested by various Substances during the Act of Rotation. By* C. Babbage, *Esq. F.R.S. and* J. F. W. Herschel, *Esq. Sec. R.S.* Read June 16, 1825. [*Phil. Trans.* 1825, *p.* 467.]

The experiments of M. Arago having excited much interest, the authors of this communication were induced to erect an apparatus for their verification; and after a few trials they succeeded in causing

a compass to deviate from the magnetic meridian, by setting in rotation under it plates of copper, zinc, lead, &c.

To obtain more visible and regular effects, however, they found it necessary to reverse the experiment, by setting in rotation a powerful horse-shoe magnet, and suspending over it the various metals and other substances to be examined, which were found to follow with various degrees of readiness the motion of the magnet. The substances in which they succeeded in developing signs of magnetism were, copper, zinc, silver, tin, lead, antimony, mercury, gold, bismuth, and carbon, in that peculiar metalloidal state in which it is precipitated from carburetted hydrogen in gas-works. In the case of mercury the rigorous absence of iron was secured. In other bodies, such as sulphuric acid, resin, glass, and other non-conductors, or imperfect conductors of electricity, no positive evidence of magnetism was obtained.

The comparative intensities of action of thin bodies were next numerically determined by two different methods, viz. by observing the deviation of the compass over revolving plates of great size cast to one pattern, and by the times of rotation of a neutralized system of magnets suspended over them; and it is curious that the two methods, though they assigned the same order to the remaining bodies, uniformly gave opposite results in the cases of zinc and copper, placing them constantly above or below each other according to the mode of observation employed.

The authors next investigated the effect of solution of continuity on the various metals, in the course of which M. Arago's results of the diminution of effect, by division of the metallic plates used, were verified; and the further fact ascertained, that re-establishing the metallic contact with other metals, restores the force either wholly or in great measure, and that even when the metal used for soldering has in itself but a very feeble magnetic power, thus affording a power of magnifying weak degrees of magnetism.

The law of diminution of the force by increase of distance is next investigated. It appears to follow no constant progression according to a fixed power of the distance, but to vary between the square and the cube.

The remainder of this paper is devoted to reasoning on the facts detailed. The authors conceive that they may be all explained without any new hypothesis in magnetism, by supposing simply that time is requisite both for the development and loss of magnetism; and that different metals differ in respect not only of the time they require, but in the intensity of the force ultimately developable in them; and they apply this explanation not only to their own results, but to those obtained by Mr. Barlow in his paper on the rotation of iron.